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BOX PATENT APPLICATION

Commissioner for Patents
Washington, D.C. 20231

UTILITY PATENT APPLICATION TRANSMITTAL
FILED UNDER 37 C.F.R. §1.53(b)

Sir:

Transmitted herewith for filing is the patent application of:

Inventor(s):

Philip A. LODWICK whose address is: 7225 Garfield Avenue, Richfield, MN 55423
and whose citizenship is: United States

Title: **PRINT DRIVER APPARATUS AND METHODS FOR FORWARDING A PRINT JOB
OVER A NETWORK**

APPLICATION ELEMENTS:

- (1) ☒ Patent Application Specification, including Abstract and claims - 46 pages
- (2) ☒ Eleven (11) sheet(s) of formal drawings, together with transmittal letter
- (3) ☐ A check in the amount of \$ to cover the ☐ filing fee(\$.00) and/or ☐ Assignment Recordal Fee (\$40) is enclosed.
- ☐ Before calculating the fee, cancel claim(s)
- ☐ Before calculating the fee, see copy of Preliminary Amendment filed in parent application _____ (attached hereto.)

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Basic Fee							\$	690.00
Multiple Dependent Claims (\$260.)								
Foreign Language Surcharge (\$130.)								
	For	No. Filed	-	No. Extra		Rate		
EXTRA	Total Claims	8	20	0	x	\$18.	=	\$ 0.00
CLAIMS	Independent Claims	6	3	3	x	\$80.	=	\$ 240.00
TOTAL FILING FEE							=	\$ 950.00

☐ The Commissioner is hereby authorized to charge any deficiency in the payment of the required fee(s) or credit any overpayment to Deposit Account No. 50-0625.

- (4) ☐ Declaration and Power of Attorney form -- 3 pages
- a. ☐ Newly executed
 - b. ☐ Copy from a prior application
 - c. ☐ Deletion of inventor(s) -- signed statement attached deleting inventor(s) named in the prior application.
- (5) ☐ Small Entity Declaration
- a. ☐ Newly executed
 - b. ☐ Copy from a prior application. Status still proper and desired.

ACCOMPANYING APPLICATION PARTS:

- (6) ☐ Assignment document
- a. ☐ Newly executed (with \$40.00 recordal fee) and separate transmittal Form PTO-1595
 - b. ☐ Copy from a prior application
- (7) ☐ Preliminary Amendment
- (8) ☐ Certified Copy of Priority Document, together with separate transmittal letter
- (9) ☐ Information Disclosure Statement, together with PTO Form 1449 and copies of cited references
- (10) ☒ Return receipt postage prepaid postcard
- (11) ☒ Express Mail Certificate (Mailing Label No. EL 632260405 US)
- (12) ☐ Other:

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- (13) [] If a **CONTINUING APPLICATION**, check appropriate box, and supply the requisite information below:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP)
of prior application no.:

Prior application information:

Examiner: _____ Group/Art Unit: _____

Status: _____

FOR CONTINUATION or DIVISIONAL APPLICATIONS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under paragraph 4(b) above, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

- (14) [] Please amend the specification by inserting before the first line the sentence:
- (15) [] This application claims the benefit of _____ Patent Application
No. _____ filed on _____.
- (16) [X] Correspondence address:
Barry R. Lipsitz
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755 Main Street, Building 8
Monroe, CT 06468
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- (17) [X] Pursuant to the provisions of 37 C.F.R. Sections 1.10 and 1.53, Applicants respectfully request that this application be assigned a serial number and a filing date of October 16, 2000, the date upon which the application was mailed to the Patent and Trademark Office by Express Mail (No. EL 632260405 US).

Respectfully submitted,



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ATTORNEY DOCKET NO.: MGI-179
Date: October 16, 2000

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)
P. Lodwick)
Filed: Herewith)
For: **PRINT DRIVER APPARATUS AND METHODS FOR**
FORWARDING A PRINT JOB OVER A NETWORK

BOX PATENT APPLICATION
Commissioner for Patents
Washington, D.C. 20231

EXPRESS MAIL CERTIFICATE

"Express Mail" mailing label number: **EI 632260405 US**
Date of Deposit: **October 16, 2000**

I hereby certify that the attached:

- ☒ Return receipt postage prepaid postcard;
- ☒ Transmittal letter for new patent application;
- ☒ Patent Application Specification including Abstract and Claims (46 pages);
- ☒ Eleven (11) sheet(s) of formal drawings, together with transmittal letter.

are being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 C.F.R. 1.10 and 1.53 on the date indicated above and is addressed to: **BOX PATENT APPLICATION, Commissioner for Patents, Washington, D.C. 20231**

Michele Hollis
(Typed or printed name of person mailing paper or fee)

Michele Hollis
(Signature of person mailing paper or fee)

Respectfully submitted,

Date: October 16, 2000
ATTORNEY DOCKET NO.: MGI-179

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**PRINT DRIVER APPARATUS AND METHODS FOR FORWARDING A PRINT
JOB OVER A NETWORK**

BACKGROUND OF THE INVENTION

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The present invention relates to methods and apparatus
5 for forwarding a print job over a communications network.
In particular, the present invention enables a user to
obtain print jobs at a location which may be unspecified,
and which may be remote from the source of the print job. A
print driver is provided which is capable of forwarding one
10 or more print jobs over a network. The print driver may be
interfaced with any suitable print job source (e.g., a
client device capable of generating a printable document,
such as a computer) to obtain a print job. The print job is
forwarded from the print driver, over the network, to a
15 spooling server. A printer polling device, which may be
used at a location remote from the client device, is
capable of polling a spooling server via the network to
identify whether any print jobs associated with the printer
polling device are available for printing at one or more
20 printers associated with the printer polling device.

As computer networks become more complex, the rate at
which network configurations change continues to increase.
Also, the increasingly frantic pace of the typical business
traveler who juggles documents on multiple computers and is
25 required to configure a traveling laptop computer to

integrate into various changing networks makes it increasingly difficult to reliably and efficiently print even a simple document.

For example, a business traveler in a hotel may wish to print to a printer that the hotel provides for such purposes. Under the current state of the art, the user must first obtain the network ID of the printer along with some information about the type of printer. Then, a print driver for that specific printer must be installed on the user's computer, and the computer must be configured to connect to the printer. This may additionally involve configuring the computer to connect to the host network.

Further, in many cases, it is desirable to be able to prepare a document for printing prior to having the information concerning the destination printer. For example, it may be desirable to print a document from a mobile laptop connected via a wireless data connection while in transit to a meeting at a site the user has never visited before. Obtaining the information and configuring the laptop to be able to print to the printer becomes logistically infeasible.

These problems have typically been solved in the past by one of the following methods:

1. The document is e-mailed or otherwise transferred over a network to a computer already configured to print to the desired printer;

2. A portable computer is connected directly to the printer via a cable or infra-red, bypassing many of the difficulties of configuring the computer to print to a network computer;

5 3. A portable printer is transported to the desired location; or

4. The document is faxed to a fax machine.

Printing methods relating to network and distributed printing are known in the prior art. Such systems require
10 either a private network or foreknowledge of the destination of a print job. These prior art methods comprise what is typically referred to as "push" technology (i.e. technology in which a print job is directed to a specific known destination or printer).

15 In addition to the need for efficiency and ease of use is the need for security when sending, storing, or printing print jobs. Early in the life of the Internet, the need for securing an organization's local network from tampering, stealing, or vandalism by outsiders became very obvious. A
20 type of gateway called a firewall was developed to meet this need. The firewall is designed to be a single, well-controlled access point between the outside, global, or wide-area network and the inside, local-area network. By carefully restricting the types of network traffic and the

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Table 1. Demographic characteristics of the study population	
Characteristic	Number (n)
Age (years)	
< 18	10
18-24	15
25-34	20
35-44	25
45-54	30
55-64	35
65-74	40
75-84	45
≥ 85	50
Gender	
Male	120
Female	180
Ethnicity	
White	100
Black	80
Hispanic	60
Asian	40
Other	20
Education level	
High school or less	150
Some college	100
Bachelor's degree	80
Master's degree	40
PhD	20
Marital status	
Married	120
Single	80
Divorced	60
Widowed	40
Income level	
< \$10,000	100
\$10,000-\$20,000	80
\$20,000-\$30,000	60
\$30,000-\$40,000	40
\$40,000-\$50,000	20
≥ \$50,000	10

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a different local area network with the data being transferred over a global network (e.g., the Internet) outside of the firewall of both local networks.

The current state of the art does have solutions for this problem. However, almost all of these solutions require the intervention of the firewall administrator. One example of a solution is the IPP - Internet Printing Protocol standard being promulgated by various vendors. This standard allows IPP-equipped printers to receive print jobs from remote clients over the Internet. However, the installation and use of IPP requires that a specific IPP hole be opened in the firewall by the network administrator.

It would be advantageous to be able to provide methods and apparatus that allow a user to print to a perhaps yet unknown destination printer or printer pool in a reliable, efficient and secure manner without the disadvantages of the above-mentioned techniques.

It would be further advantageous to provide a printing system based on "pull" technology (i.e. technology which enables a print job to be printed upon request, where the print file is only delivered in response to said request). Such technology would enable a system that allows a user to print to a destination printer or printer pool that may be located anywhere, in a reliable, efficient, and secure

[illegible]

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The methods and apparatus of the present invention provide the foregoing and other advantages.

SUMMARY OF THE INVENTION

The present invention relates to methods and apparatus for forwarding a print job over a communications network. In particular, the present invention enables a user to
5 obtain print jobs at a location which may be unspecified, and which may be remote from the source of the print job.

In an illustrative embodiment, a print driver is provided which is capable of forwarding one or more print jobs over a network. The print driver may be interfaced
10 with any suitable print job source (e.g., a client device capable of generating a printable document, such as a computer) to obtain a print job. The print job is forwarded from the print driver, over the network, to a spooling server (e.g., via a transmitter). The spooling server
15 receives the print job and stores the print job in memory. The spooling server receives a polling request over the network for a print job from a printer polling device. The spooling server forwards the requested print job to the printer polling device for printing at one or more
20 associated printers.

The print driver may be integrated into the print job source or may comprise a stand-alone device associated with a print job source.

The print job can originate from any suitable print
25 job source, such as a client device with an associated

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server as web-style traffic and received at the spooling server as web-style traffic.

The print driver may be located at and in communication with a first local area network for forwarding the print job to the spooling server. The printer polling device may be located at and in communication with a second local area network. The spooling server may be located outside of the first and second local area networks. The print driver may communicate with the spooling server via a first gateway firewall which controls access to the first local area network and the printer polling device may communicate with the spooling server via a second gateway firewall which controls access to the second local area network.

The spooling server may store multiple print jobs in at least one spooling queue.

The print job may be encrypted at the print driver or the print job source and decrypted at the printer polling device.

The print job may comprise a document provided by a content provider. The content provider may be one of a newspaper, a magazine, a periodical, a document provider, a graphic arts provider, a notification service, an Internet content provider, a merchant, a financial institution, a government agency, a shipping company, or the like.

In a further embodiment, each print job may be stored on the spooling server according to a personal identification number (PIN) provided with each print job. The spooling server may communicate to the printer polling device a list of print jobs associated with the PIN which are stored at the spooling server. The selection of a print job from the list may be provided for (e.g., via a user interface).

A plurality of print jobs may be stored on the spooling server according to the PIN. The PIN may be provided to the spooling server via one of a the print driver, user interface associated with the printer polling device, a telephone, a computer, an Internet appliance, a facsimile machine, a scanner, a personal digital assistant device, a dedicated terminal, or the like.

In a further embodiment, the print job may be provided to the spooling server by the print driver without a pre-determined print destination. Alternatively, a desired print location for the print job may be designated at the print driver. The designated print location may be communicated to the spooling server with the print job. The print job may be printed at the desired print location when the printer polling device at the desired print location polls the spooling server and identifies the print job.

Further, a substantially specific time for printing a print job may be designated such that the print job is only

available for printing from the spooling server at the designated substantially specific time.

In addition, a lifetime of the print job may be designated, wherein said print job will be stored on the spooling server only for the designated lifetime.

A number of printings of the print job may be designated, wherein the print job can only be printed the designated number of times.

A list of recipients authorized to retrieve a print job may be designated, wherein the print job may only be printed by the designated recipients.

The print job may be one of a negotiable instrument, a stamp, a coupon, a certificate, a check, a unit of currency, a token, a receipt, or the like.

The print job may include at least one of a document, a poster, an image, a coupon, a ticket, a certificate, a check, a list, a schedule, a periodical, a unit of currency, a negotiable instrument, postage, a bill of lading, a lottery or gaming ticket, a token, food stamps, a license, a permit, a pass, a passport, a ballot, a citation, identification, a copy-protection key, a proof-of-purchase, a warranty, a receipt, a transcript, a library card, or any other printable subject matter.

In an alternate embodiment, an agent program provides a directory of documents to the spooling server. The agent program enables a client device associated with the print

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driver to poll the spooling server to determine whether the spooling server requires a document identified in the directory to complete a print job. If so, the document can be uploaded from the client device to the spooling server.

5 The directory can be communicated to the printer polling device and presented at the printer polling device. Selection of a print job from the directory can be made (e.g., via a user interface).

10 The directory may be presented via a visual presentation or an audio presentation. The client device may periodically poll the spooling server to determine whether the spooling server requires a document identified in the directory to complete a print job.

15 Communications with the spooling server may be enabled via at least one of a telephone, a personal digital assistant device, a computer, an Internet appliance, a web browser, a dedicated terminal, or the like. The communications with the spooling server may be via an audio interface or a visual interface.

20 A communication device for providing status of the print job stored on the spooling server may be provided. The status of the print job may comprise at least one of filename, file size, author, creation date, print job lifetime, image, title, contents, personal identification
25 number, recipient, job number, or reference number. The communication device may be a telephone, a computer, an

Internet appliance, a personal digital assistant device, a dedicated terminal, or any other suitable wireless or wired communication device.

2025 RELEASE UNDER E.O. 14176

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a block diagram of an implementation of the present invention;

5 Figure 2 is a flow diagram showing an example of an encryption process which can be implemented in accordance with the invention;

Figure 3 shows a representation of a printer polling device;

10 Figure 4 is a block diagram of an alternate embodiment of the invention;

Figure 5 is a flow diagram of an authentication procedure which can be implemented in accordance with the invention;

15 Figure 6 shows an example of communications which take place between various components of the invention;

Figure 7 is a flow chart illustrating an example print job reformatting routine;

Figure 8 is a block diagram of an embodiment of a printer polling device;

20 Figure 9 is a block diagram of an embodiment of a spooling server;

Figure 10 is a block diagram of an embodiment of a print driver; and

25 Figure 11 is a block diagram of an embodiment of an agent program.

DETAILED DESCRIPTION OF THE INVENTION

The present invention enables print jobs to be sent from a print driver to a spooling server for storage. The print jobs are subsequently delivered to one or more
5 printers, on request, via a printer polling device. The printer polling device uses "pull" technology, which polls the spooling server so that the spooling server does not have to initiate a connection into a printer. In this manner print jobs can be securely printed anywhere, either
10 automatically or at the request of a user who is authorized by the printer polling device and/or the spooling server. Since the spooling server need not initiate contact with any device, there is no potential breach of firewall security in a local network environment.

15 In one embodiment, a portable printer polling device is provided to enable retrieval and printing of documents from any location having Internet access and a printer. The spooling server functions as a repository that is accessible, e.g., via a global communication network such
20 as the Internet, to authorized users at any time of day. Since the printer polling device polls the spooling server in order to obtain delivery of a print job, prior art push data flow techniques, which could compromise a local area network's security, are avoided. Moreover, compatibility
25 with virtually all printers that may be connected to the

Description		Value
1	1.0000	1.0000
2	0.9999	0.9999
3	0.9998	0.9998
4	0.9997	0.9997
5	0.9996	0.9996
6	0.9995	0.9995
7	0.9994	0.9994
8	0.9993	0.9993
9	0.9992	0.9992
10	0.9991	0.9991
11	0.9990	0.9990
12	0.9989	0.9989
13	0.9988	0.9988
14	0.9987	0.9987
15	0.9986	0.9986
16	0.9985	0.9985
17	0.9984	0.9984
18	0.9983	0.9983
19	0.9982	0.9982
20	0.9981	0.9981
21	0.9980	0.9980
22	0.9979	0.9979
23	0.9978	0.9978
24	0.9977	0.9977
25	0.9976	0.9976
26	0.9975	0.9975
27	0.9974	0.9974
28	0.9973	0.9973
29	0.9972	0.9972
30	0.9971	0.9971
31	0.9970	0.9970
32	0.9969	0.9969
33	0.9968	0.9968
34	0.9967	0.9967
35	0.9966	0.9966
36	0.9965	0.9965
37	0.9964	0.9964
38	0.9963	0.9963
39	0.9962	0.9962
40	0.9961	0.9961
41	0.9960	0.9960
42	0.9959	0.9959
43	0.9958	0.9958
44	0.9957	0.9957
45	0.9956	0.9956
46	0.9955	0.9955
47	0.9954	0.9954
48	0.9953	0.9953
49	0.9952	0.9952
50	0.9951	0.9951
51	0.9950	0.9950
52	0.9949	0.9949
53	0.9948	0.9948
54	0.9947	0.9947
55	0.9946	0.9946
56	0.9945	0.9945
57	0.9944	0.9944
58	0.9943	0.9943
59	0.9942	0.9942
60	0.9941	0.9941
61	0.9940	0.9940
62	0.9939	0.9939
63	0.9938	0.9938
64	0.9937	0.9937
65	0.9936	0.9936
66	0.9935	0.9935
67	0.9934	0.9934
68	0.9933	0.9933
69	0.9932	0.9932
70	0.9931	0.9931
71	0.9930	0.9930
72	0.9929	0.9929
73	0.9928	0.9928
74	0.9927	0.9927
75	0.9926	0.9926
76	0.9925	0.9925
77	0.9924	0.9924
78	0.9923	0.9923
79	0.9922	0.9922
80	0.9921	0.9921
81	0.9920	0.9920
82	0.9919	0.9919
83	0.9918	0.9918
84	0.9917	0.9917
85	0.9916	0.9916
86	0.9915	0.9915
87	0.9914	0.9914
88	0.9913	0.9913
89	0.9912	0.9912
90	0.9911	0.9911
91	0.9910	0.9910
92	0.9909	0.9909
93	0.9908	0.9908
94	0.9907	0.9907
95	0.9906	0.9906
96	0.9905	0.9905
97	0.9904	0.9904
98	0.9903	0.9903
99	0.9902	0.9902
100	0.9901	0.9901

The print job can originate from any suitable print job source 10. As shown in Figure 1, the print job source 10 may be a client device 12 associated with print driver 14. The print driver 14 may receive the print job from an originating application 15, which can be any program capable of producing a printable document. The print job source 10 may also be a web browser, a facsimile machine, a scanner, a telephone, an Internet appliance, a personal digital assistant, or the like. A print job can also originate on the spooling server 50 itself or be obtained from another

server. The client device 12 may be a computer, a telephone, a personal digital assistant, an Internet appliance, a facsimile machine, a scanner, or the like.

5 The identified print job can be transmitted from the spooling server 50 to the printer polling device 100 and printed at a printer 120 coupled to the printer polling device 100. Printer 120 may be a single printer or a pool of one or more printers coupled via a print server.

10 The printer polling device 100 may periodically poll the spooling server 50 to identify a print job associated with the printer polling device 100. Security is achieved by the fact that the printer 120 is not passively accepting any and all connections from the outside. The printer polling device 100 is initiating connections to a specific,
15 trusted location, the spooling server 50.

The network 110 may comprise at least one of a local area network, a wide area network, a global network, the Internet, and any other type of network. The network 110 may consist of multiple interconnected networks having
20 multiple gateways and other features as is well known in the art.

In an alternate embodiment, the printer polling device 100 may be located within a gateway firewall 70 and the spooling server may be located outside the gateway firewall
25 70. In addition, the print job source 10 may be located within a gateway firewall 30 and the spooling server may be

located outside the gateway firewall 30.

The print job may be forwarded to and from the spooling server 50 such that reconfiguration of gateway firewalls 30 and 70 is not required. For example, the print job may be forwarded to the spooling server 50 as web-style traffic and received at the printer polling device 100 as web-style traffic. For example, a print driver 14 may accept print requests from application 15 like any other print driver, but instead of routing the print requests onto the network 110 using normal printer packets and well-known-ports, it routes the output of the print job to the spooling server 50 located outside of the firewall 30 using packets and ports that resemble web traffic.

Similarly, using web types of packets and ports, the printer polling device 100 is capable of polling the spooling server 50 and retrieving any print jobs that have been stored for the printer 120.

As shown in Figure 1, the print job source 10 may be located at and in communication with a first local area network 20 and the printer polling device 100 may be located at and in communication with a second local area network 80. The spooling server 50 may be located outside of the first and second local area networks 20, 80. The print job source 10 may communicate with the spooling server 50 via a first gateway firewall 30 which controls access to the first local area network 20 and the printer polling device 100 may

communicate with the spooling server 50 via a second gateway firewall 70 which controls access to the second local area network 80.

The printer polling device 100 may be: (i) a stand-alone device connected to the printer 120 via a standard printer port, (ii) integrated into the firmware of the printer 120, (iii) integrated into the software of a network print server, or (iv) of any other suitable configuration. The printer polling function may also be integrated into the software on a stand-alone print server such as those manufactured by Electronics for Imaging, Inc. (Foster City, California) under the trademarks Fiery® and EDOX®.

In a preferred embodiment, a fee may be charged to access the spooling server 50. The fee can be based on one of print job size in bytes, print job size in number of pages, print job type, time for printing, time for storage, monthly fee, per use fee, lifetime membership, monthly membership, use of color, use of black and white, page size, location, convenience, number of images, print quality, image quality, or other suitable factors. The fee may be charged for providing a print job to the spooling server 50 and/or retrieving a print job from the spooling server 50. The fee can be paid via a client device 12 associated with the print job source 10, the printer polling device 100, or any other suitable device capable of communicating with the spooling server, such as a smart

card, a telephone, a personal digital assistant, or the like.

The spooling server 50 may store the one or more print job(s) in at least one spooling queue 52. The spooling server 50 may be maintained by a trusted party on the outside of the firewalls 30, 70. Alternatively, the spooling server 50 may be owned and maintained by the organizations desiring to utilize inter-network printing.

Since the communications amongst the print job source 10, the spooling server 50, and the printer polling device 100 may travel across public networks, it is very desirable to protect any proprietary or confidential information that may be embodied in the print jobs.

In a preferred embodiment, the print job may be encrypted at the print job source 10 and decrypted at the printer polling device 100. For example, the print job can be encrypted on the client device 12 such that it can only be printed by a person with the correct decryption key. In addition, printing of the document can be delayed until the key is physically entered at the printer polling device 100 (e.g., the recipient is physically present at the printer 120).

A flow diagram of an example of an encryption process used between the print job source 10, the spooling server 50 and the printer polling device 100 is shown in Figure 2. The print job 11 is protected by encrypting the print job

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5 (indicated at 501) at the print job source 10 (e.g., on the
print driver 14 or an agent program on the originating
client device 12 of Figure 1) and decrypting it at the
spooling server 50. The encryption algorithm may be the IDEA
10 algorithm. Other suitable encryption algorithms which can be
utilized are DES (the Data Encryption Standard), or triple-
DES (DES applied to the data three times with three
different keys). Other encryption algorithms suitable for
commercial confidential information are numerous and well
known in the art of data encryption.

15 The key 500 used for encryption 501 may be derived
from an account number 510, a user's secret PIN (personal
identification number) 520, and/or optionally some
additional encryption key digits 530 supplied by the user.
Simply concatenating the bits together from these sources
provides a moderately secure key 500. Optionally,
additional security may be achieved by using a more
sophisticated hashing function.

20 The key 500 would be known only to the user and to the
secure, trusted, spooling web server 50. The encrypted
print job is sent to the spooling server 50 where it is
decrypted (601) to facilitate reformatting 602 for the
destination printer once it is known. The reformatted print
job data is re-encrypted 603 using the same or similar key
25 500' derived in the same manner as key 500 at the print job
source 10. The encrypted print job is then transmitted from

the spooling server 50 to the printer polling device 100. Once at the printer polling device 100, the print job is decrypted 701 using a key 500'' derived from the PIN 520, account number 510, and/or optional encryption key extension digits 530. The decrypted print job can then be forwarded to the printer 120 for printing.

The print job 11 may comprise a document provided by a content provider. The content provider may be one of a newspaper, a magazine, a periodical, a document provider, a graphic arts provider, a notification service, an Internet content provider, a merchant, a financial institution, a government agency, a shipping company, or the like. For example, instead of physically delivering the daily sports page, it is simply printed on a customer's home printer.

The print job 11 may be provided by the content provider on a subscription basis. A single print job may be provided by the content provider for printing by multiple users.

The printer polling device 100 may comprise a user interface, a connection to the network 110, and a connection to the printer 120. Figure 3 shows an embodiment of a user interface 103 for the printer polling device 100 having a display 101 and a keypad 102. The keypad 102 shown in Figure 3 may also comprise an alphanumeric keypad to allow for entry of both letters and numbers. The user interface may optionally include a speaker and a microphone

[illegible]

5 In a further embodiment as shown in Figure 4, each print job may be stored on the spooling server 50 according to a personal identification number (PIN) 400. As an example, Figure 4 shows the PIN 400 entered at a client device 12. The PIN 400 is forwarded to the spooling server 50 by the print driver 14 along with the print job. The spooling server 50 may communicate to the printer polling device 100 a list of print jobs associated with the PIN 400 which are stored at the spooling server 50. The selection of a print job from the list may be provided for (e.g., via a user interface). For example, a small terminal may be provided at each printer polling device 100 to allow a user to interact with the spooling server 50 and request that the user's print jobs be sent to the printer 120 at the user's location. The user may identify himself or herself at the printer polling device 100 with their PIN 400, and the spooling server 50 can then match that PIN 400 with print jobs previously submitted using that same PIN 400.

A plurality of print jobs may be stored on the spooling server 50 according to the PIN 400 (e.g., in spooling queue 25 52). For example, a directory may be created for each user, and thus each PIN, registered with the spooling server 50.

Each print job may additionally be assigned a unique job number at the time it is first received at the spooling server 50. Thereafter, the job number may be used to access the data files associated with that job unambiguously. Once
5 a print job has been selected to be printed to a destination printer 120, the job number for the print job may be entered into a queue associated with the destination printer 120. Data structures suitable for maintaining a queue are well known in the art. In the preferred embodiment, the queue
10 is maintained in a C++ class known as a CList provided by Microsoft in their C++ class library.

When the printer polling device 100 polls the spooling server 50, the spooling server 50 checks to see if the queue for that printer 120 contains any print jobs. When
15 the spooling server 50 finds a print job waiting to be printed, the data for that print job is retrieved from the file system, reformatted in a form suitable for the identified printer 120, and transmitted to the printer polling device 100.

20 The PIN 400 may be provided to the spooling server 50 via one of a user interface associated with the printer polling device 100, a telephone, a computer, an Internet appliance, a facsimile machine, a scanner, a personal digital assistant device, a dedicated terminal, or the like.
25 The list of available print jobs may be displayed on one of a user interface associated with the printer polling device

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100, a telephone, a computer, an Internet appliance, a facsimile machine, a scanner, a personal digital assistant device, a dedicated terminal, or the like. Selection of an available print job may be made via a user interface
5 associated with the printer polling device 100, a telephone, a computer, an Internet appliance, a facsimile machine, a scanner, a personal digital assistant device, a dedicated terminal, or the like.

Figure 5 illustrates an exemplary process of
10 authentication of a user using a PIN. When a user desires to access their account or documents over a non-secure channel, first, the spooling server 50 needs to verify that it is indeed talking to the actual user. The server generates a random string of bits 350. These bits are sent
15 to the printer polling device 100 where authentication is to take place. The user's PIN 150 is used to generate an encryption key 152 for encrypting the bits (indicated at 155) and the result is returned to the spooling server 50. The spooling server 50 decrypts the string (indicated at
20 355) using an encryption key 362 generated from the PIN it knows (360) and compares it to the original random string (indicated at 365). If the decrypted string 358 matches the original string 350, the spooling server 50 accepts the user as authenticated. An account number (361, 151) may
25 optionally be used (either alone or in connection with the PIN) to generate the encryption keys 362, 152. Many other

authentication protocols are well known in the art and may be substituted for the protocol described above in connection with Figure 5.

5 The printer polling device 100 may be a portable device. The printer polling device 100 may be operably associated with a variety of printer types.

10 In a further embodiment, the print job may be provided to the spooling server 50 without a pre-determined print destination. A user is able to interact with the printer polling device 100 and communicate the identification of the desired print destination for the user's print job to the spooling server 50. The user need not know anything more about the printer 120 than its location (which the user needs anyway to be able to retrieve the physical
15 output pages).

Alternatively, a desired print location for the print job may be designated at the print job source 10. The designated print location may be communicated to the spooling server 50 with the print job. The print job may be
20 printed at the desired print location when the printer polling device 100 at the desired print location polls the spooling server 50 and identifies the print job.

Further, a substantially specific time for printing a print job may be designated such that the print job is only
25 available for printing from the spooling server 50 at the designated substantially specific time.

Table 1. Demographic characteristics of the study population	
Age (years)	65.5 ± 10.5
Gender	
Male	100
Female	100
Education (years)	12.5 ± 3.5
Marital status	
Married	100
Divorced	100
Widowed	100
Single	100
Occupation	
Retired	100
Unemployed	100
Employed	100
Income (USD/month)	1,200 ± 200
Health status	
Good	100
Fair	100
Poor	100
Comorbidities	
Hypertension	100
Diabetes	100
Cholesterol	100
Smoking status	
Smoker	100
Non-smoker	100
Alcohol consumption	
Drinker	100
Non-drinker	100
Medication use	
Yes	100
No	100
Family size	3.5 ± 1.5
Living alone	100
Living with family	100
Living with friends	100
Living in a nursing home	100
Living in a community	100
Living in a rural area	100
Living in an urban area	100
Living in a suburban area	100
Living in a coastal area	100
Living in a mountainous area	100
Living in a desert area	100
Living in a tropical area	100
Living in a temperate area	100
Living in a cold area	100
Living in a hot area	100
Living in a dry area	100
Living in a wet area	100
Living in a hilly area	100
Living in a flat area	100
Living in a valley area	100
Living in a plateau area	100
Living in a basin area	100
Living in a delta area	100
Living in a coastal plain area	100
Living in a mountainous region	100
Living in a desert region	100
Living in a tropical region	100
Living in a temperate region	100
Living in a cold region	100
Living in a hot region	100
Living in a dry region	100
Living in a wet region	100
Living in a hilly region	100
Living in a flat region	100
Living in a valley region	100
Living in a plateau region	100
Living in a basin region	100
Living in a delta region	100
Living in a coastal plain region	100
Living in a mountainous area	100
Living in a desert area	100
Living in a tropical area	100
Living in a temperate area	100
Living in a cold area	100
Living in a hot area	100
Living in a dry area	100
Living in a wet area	100
Living in a hilly area	100
Living in a flat area	100
Living in a valley area	100
Living in a plateau area	100
Living in a basin area	100
Living in a delta area	100
Living in a coastal plain area	100
Living in a mountainous area	100
Living in a desert area	100
Living in a tropical area	100
Living in a temperate area	100
Living in a cold area	100
Living in a hot area	100
Living in a dry area	100
Living in a wet area	100
Living in a hilly area	100
Living in a flat area	100
Living in a valley area	100
Living in a plateau area	100
Living in a basin area	100
Living in a delta area	100
Living in a coastal plain area	100
Living in a mountainous area	100
Living in a desert area	100
Living in a tropical area	100
Living in a temperate area	100
Living in a cold area	100
Living in a hot area	100
Living in a dry area	100
Living in a wet area	100
Living in a hilly area	100
Living in a flat area	100
Living in a valley area	100
Living in a plateau area	100
Living in a basin area	100
Living in a delta area	100
Living in a coastal plain area	100
Living in a mountainous area	100
Living in a desert area	100
Living in a tropical area	100
Living in a temperate area	100
Living in a cold area	100
Living in a hot area	100
Living in a dry area	100
Living in a wet area	100
Living in a hilly area	100
Living in a flat area	100
Living in a valley area	100
Living in a plateau area	100
Living in a basin area	100
Living in a delta area	100
Living in a coastal plain area	100
Living in a mountainous area	100
Living in a desert area	100
Living in a tropical area	100
Living in a temperate area	100
Living in a cold area	100
Living in a hot area	100
Living in a dry area	100
Living in a wet area	100
Living in a hilly area	100
Living in a flat area	100
Living in a valley area	100
Living in a plateau area	100
Living in a basin area	100
Living in a delta area	100
Living in a coastal plain area	100
Living in a mountainous area	100
Living in a desert area	100
Living in a tropical area	100
Living in a temperate area	100
Living in a cold area	100
Living in a hot area	100

15

25

network to behave as if they are locally connected to the network by forwarding the data packets through some type of public or intermediate network. For security, authentication of the node desiring to connect to the network is performed, as well as encryption of the contents of the forwarded packets. Various commercial products allow the setup and configuration of VPN's through various connectivity mechanisms such as dial-up ISP's, Cable Modems, and DSL on the client node end. The local network that is being connected to will require a router or router/firewall that implements the VPN protocol to allow the VPN connection. A VPN is made up of two components: L2TP (Layer 2 tunneling protocol) and IPSEC (Internet Protocol Security).

In a preferred embodiment, the printer polling device 100 is capable of communicating the status of the printer 120 to the spooling server 50. The printer status may comprise at least one of a printer ready indication, an on-line indication, toner level information, paper supply information, error information, or other appropriate status information.

A printer operator can be notified when the printer status indicates that the printer 120 requires attention. The operator can also be provided with vendor contact information to facilitate obtaining printer supplies or service. Automatic on-line ordering of printer supplies as

required by printer status can be provided (e.g., by the spooling sever 50 contacting predetermined preferred vendors).

The print job may include at least one of a document,
5 a poster, an image, a coupon, a ticket, a certificate, a
check, a list, a schedule, a periodical, a unit of
currency, a negotiable instrument, postage, a bill of
lading, a lottery or gaming ticket, a token, food stamps, a
license, a permit, a pass, a passport, a ballot, a
10 citation, identification, a copy-protection key, a proof-
of-purchase, a warranty, a receipt, a transcript, a library
card, or any other printable subject matter.

As illustrated in Figure 6, the printer polling device
100 may periodically poll the spooling server 50. The
15 interval of the polling can vary as desired and can be
adjusted dynamically based upon such factors as traffic or
requests for files. The polling request (query) 210 is
preferably encrypted. Because the query 210 is directed to
a specific spooling server 50, it is difficult for a third
20 party to breach the system's security. The query 210 asks
the spooling server 50 if it has a print job identified by
the user (e.g., via a PIN or a job number). Once the
spooling server 50 has received a request 210 from the
printer polling device 100 for a print job that is stored
25 at the spooling server 50, the spooling server 50 waits for
the next query 210 from the printer polling device 100.

Then, instead of its normal answer to the query of "NACK" (negative acknowledge) 220, the spooling server 50 answers "ACK" (acknowledge) 230 and transmits the print job to the destination printer 120.

5 In an alternate embodiment as shown in Figure 11, an agent program 200 provides a directory of documents 204 to the spooling server 50. The agent program 200 enables a client device 12 associated with the print job source 10 to poll the spooling server 50 to determine whether the
10 spooling server 50 requires a document 13 identified in the directory 204 to complete a print job. If so, the document 13 can be uploaded from the client device 12 to the spooling server 50. The agent 200 enables a user at a printer 120 (or using any of the available interfaces to
15 the spooling server 50) to initiate the printing of documents 13 that still reside on a client device 12 (such as the user's computer) even though the documents 13 have not been forwarded to the spooling server 50 as print jobs.

The agent program 200 may be downloaded and installed
20 on the client device 12. The agent program 200 may be configured to make the contents of some or all of the directories 204 on the client device 12 available to the spooling server 50. Once installed and running, the agent program 200 initiates a connection to the spooling server
25 50 in the same way the printer polling device 100 does. The

agent program may have a connection through a firewall, for example.

The directory of documents 204 may include application files such as a Microsoft Word .doc file, for example, or
5 files that have been made into a print job (Postscript or PDF file) by printing "to a file" from some application.

The directory 204 can be communicated to the printer polling device 100 and presented at the printer polling device 100. Selection of a print job 11 from the directory
10 can be made (e.g., via a user interface).

For example, the spooling server 50 will list those documents 13 being available from the agent program 200 whenever the user of that account is interacting with the printer polling device 100, or any other interface provided
15 for communication to the spooling server 50 as described herein.

For example, the agent program 200 may periodically poll the spooling server 50 via polling interface 202. The interval of the polling can vary as desired and can be
20 adjusted dynamically based upon such factors as traffic or requests for files. The communications between the agent program 200 and the spooling server 50 occur substantially as described in connection with Figure 6 above. The polling request (query) 206 is preferably encrypted. Because the
25 query 206 is directed to a specific spooling server 50, it is difficult for a third party to breach the system's

security. The query 206 asks the spooling server 50 if it wants any files in the directory 204 (and may also update the directory 204). Once the spooling server 50 has received a request 207 from the printer polling device 100 for a document that is listed in the directory 204, the spooling server 50 waits for the next query 206 from the agent program 200. Then, instead of its normal answer to the query of "NACK" (negative acknowledge), it answers "ACK" (acknowledge) followed by document information, such as the name of the document that is requested by request 207.

The agent program 200, upon receiving an "ACK" and the request information 207, opens the document 13 using the application it was created in and prints it to a temporary file 205 to create a print job 11. This print job 11 is then transmitted to the spooling server 50 via transmitter 203. The spooling server 50 uses its normal mechanism to then transmit the print job 11 to the destination printer 120.

Alternatively, the spooling server 50 may send an "ACK" followed by the name of a subdirectory. In that case, the agent program 200 returns the contents of that subdirectory. The spooling server 50 can then display those files to the user at the printer polling device 100 and allow one of the files to be selected, or allow additional navigation of directory 204 to take place.

The directory 204 may be presented via a visual presentation or an audio presentation. The client device 12 may periodically poll the spooling server 50 to determine whether the spooling server 50 requires a document from the
5 directory 204 to complete a print job.

Communications with the spooling server 50 may be enabled via at least one of a telephone, a personal digital assistant device, a computer, an Internet appliance, a web browser, a dedicated terminal, or the like. The
10 communications with the spooling server 50 may be via an audio interface or a visual interface.

A communication device for providing status of the print job stored on the spooling server 50 may be provided. The status of the print job may comprise at least one of
15 filename, file size, author, creation date, print job lifetime, image, title, contents, personal identification number, recipient, job number, or reference number. The communication device may be a telephone, a computer, an Internet appliance, a personal digital assistant device, a
20 dedicated terminal, or any other suitable wireless or wired communication device.

The print job source 10 may be one of a computer, a personal digital assistant device, an Internet appliance, a telephone, a facsimile machine, a scanner, a dedicated
25 terminal, or other suitable source.

The printer polling device 100 may be capable of

polling multiple spooling servers.

The spooling server 50 may be capable of communicating with other servers and receiving a print job from at least one of the other servers.

5 The print jobs submitted from the print job source 10 to the spooling server 50 may be generated in a page description language known as Postscript. Alternate choices for a page description language are PDF, Latex, or other similar languages. The size of the paper, various printer capabilities, and printable area dimensions may be assumed
10 from a lowest common denominator set of capabilities common to most of the intended target printers.

 Once the destination printer 120 is known, the page description language data needs to be converted into a form
15 that can be understood by that printer 120. This process is shown in Figure 7. Once the print job 11 is sent to the spooling server 50, a target printer 120 must be identified before the spooling server 50 can forward the print job 11 to be printed. Target printer identification 801 can be
20 provided with the print job 11 from the print job source 10 or can be provided by the printer polling device 100 as part of the polling query. The spooling server 50 retrieves printer specific information 805 for the target printer 120 from a printer database 803. Based on the printer specific
25 information 805 (such as data type, page dimensions, color capabilities, margins, and other print characteristics) the

spooling server 50 will make printer specific adjustments 810 to the print job 11 at the page description language level prior to rasterization.

On printers that can accept Postscript (or the PDL of choice) directly, no modification is necessary. For other, simpler printers, a lower level bitmap form of the page is required to be sent to the printer. In this case, the page description language needs to be rasterized into a bitmap form. In addition, the bitmap data needs to be formatted into the form understood by the printer 120. A raster image processor 815 determines the target printer type from the printer specific information 805 and selects an appropriate data format from available formats 820, 821, 822, 823. The raster image processor 815 places the print job 11 into a printer specific data file 850 for delivery to the printer polling device 100 to be printed at the target printer 120.

One common example of a data format used with simple printers is PCL (Printer Control Language), which is widely used in printers built by Hewlett Packard. Other printers built by Epson, for example use Epson's proprietary Epson-escape code sequences to format the bitmap data.

Alternatively, reformatting of the print job may take place at the printer 120, at the printer polling device 100, or at any other suitable device.

25 Figure 8 shows the components of an embodiment of a
printer polling device 100. As discussed above in

connection with Figure 3, the printer polling device may optionally include a user interface 103 for enabling communications with the spooling server 50 (e.g., providing a PIN to the spooling server 50). A polling transmitter 105 is provided for transmitting polling requests to the spooling server 50 via the network 110 to identify a print job stored at the spooling server 50 (as discussed in connection with Figures 1 and 4 above). A print job receiver 108 is provided for receiving the identified print job from the spooling server 50 via the network 110. Decryption 111 of an encrypted print job may optionally be provided for at the printer polling device 100. A printer interface 112 enables the printer polling device 100 to forward the print job to a printer 120 for printing.

Figure 9 shows the components of an embodiment of a spooling server 50. A receiver 51 is provided which is capable of receiving print jobs from the print job source 10 and receiving polling requests from the printer polling device 100. The receiver 51 may comprise a print job receiver 58 for receiving the print job and a polling receiver 59 for receiving the polling request. When a print job is received by the receiver 51, the spooling server 50 stores the print job in memory 52, which may comprise random access memory (RAM), magnetic or optical storage media, or any other read/write memory device. As discussed herein, the print jobs may be stored in memory 52 according

to a PIN. Multiple print jobs may be stored under each PIN as shown at 53, 54, and 55. When the spooling server 50 receives a polling request for a specific print job from the printer polling device 100 at the receiver 51, the
5 spooling server 50 will determine whether the requested print job is stored in memory 52, and if so, forward the requested print job to the printer polling device 100 via transmitter 57. A processor 56 enables the spooling server to search for, retrieve, and/or reformat the print job for
10 delivery to the printer polling device 100.

Figure 10 shows the components of an embodiment of a print driver 14. An interface 16 is provided for receiving a print job from a print job source 10. The print job source 10 is shown in Figure 10 as a client device 12, but
15 can be any suitable print job source as discussed herein. The interface 16 receives a printable document 13 from the client device 12. A transmitter 18 is provided for transmitting the print job 11 to the spooling server 50 via the network 110. The spooling server 50 receives polling
20 requests from the printer polling device 100 and forwards one or more identified print jobs to the printer polling device 100 in response to the polling requests. The print jobs can then be printed at a printer 120 associated with the printer polling device 100. As discussed in greater
25 detail elsewhere herein, the printer polling device 100 does not have to identify specific print jobs to the

spooling server 50. Instead, it can simply request a list of all print jobs (if any) currently stored at the spooling server 50 for that specific printer polling device 100, or for a particular PIN number (or other identifier) entered via the printer polling device 100 or other device. As discussed elsewhere herein, the list of print jobs may be accessed via various other devices capable of communicating with the spooling server 50.

It will now be appreciated that the present invention provides improved methods and apparatus for forwarding print jobs over a communications network in a secure manner without the need to specify the print destination. Print jobs are forwarded to a spooling server by a print driver. By using a printer polling device, the disadvantages of prior art push data flow techniques are overcome. Instead of having a remote device initiate contact with a print station behind a firewall, the present invention provides a printer polling device that polls a spooling server to determine if there are any documents to be printed by a printer associated with the printer polling device. Compatibility with all types of printers is also provided.

Although the invention has been described in connection with preferred embodiments thereof, those skilled in the art will appreciate that numerous adaptations and modifications may be made thereto without departing from

the spirit and scope of the invention, as set forth in the following claims.

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1. A method for communicating a print job over a network,
comprising:

operably associating the print driver with a client device, said client device capable of generating a printable document and providing print requests to the print driver; and

said spooling server is capable of receiving and storing said print job from the print driver via the network; and

2. A method for communicating a print job over a network, comprising:

operably associating the print driver with a client device, said client device capable of generating a printable document and providing print requests to the print driver; and

Table 1. Demographic characteristics of the study population	
Age (years)	65.2 (SD 10.5)
Gender	
Male	55.2%
Female	44.8%
Education (years)	12.5 (SD 3.2)
Marital status	
Married	68.5%
Widowed	22.1%
Divorced	8.3%
Single	1.1%
Income (USD/month)	1,250 (SD 450)
Health status	
Good	72.3%
Fair	18.7%
Poor	9.0%
Comorbidities	
Hypertension	45.6%
Diabetes	32.1%
Cholesterol	28.9%
Arthritis	15.4%
Depression	12.8%
Medication use	
Yes	65.4%
No	34.6%
Living arrangement	
Alone	25.3%
With family	74.7%
Access to healthcare	
Yes	89.2%
No	10.8%

enabling said print driver to forward the print job to a spooling server via the network; wherein:

said print driver forwards said print job to said spooling server as web-style traffic.

3. A method in accordance with claim 2, wherein:

the print driver is located within a gateway firewall;

the spooling server is located outside of said gateway firewall; and

the print driver forwards the print job to the spooling server such that reconfiguration of the gateway firewall is not required.

4. A method for communicating a print job over a network, comprising:

providing a print driver;

operably associating the print driver with a client device, said client device capable of generating a printable document and providing print requests to the print driver; and

enabling said print driver to forward the print job to a spooling server located via the network;

providing a personal identification number (PIN) with each print job forwarded to the spooling server; and

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a transmitter enabling said print driver to forward the print job to a spooling server via the network; wherein:

said print driver forwards said print job to said spooling server as web-style traffic.

7. A print driver in accordance with claim 6, wherein:

the print driver is located within a gateway firewall;

the spooling server is located outside of said gateway firewall; and

the print driver forwards the print job to the spooling server such that reconfiguration of the gateway firewall is not required.

8. A print driver for communicating a print job over a network, comprising:

an interface for receiving a print job from a client device, said client device capable of generating a printable document and providing print requests to the print driver; and

a transmitter enabling said print driver to forward the print job to a spooling server via the network; wherein:

a personal identification number (PIN) is provided with each print job forwarded to the spooling server; and

2025 RELEASE UNDER E.O. 14176

[illegible]

ABSTRACT

The present invention relates to methods and apparatus for forwarding a print job over a communications network. In particular, the present invention enables a user to obtain print jobs at a location which may be unspecified, and which may be remote from the source of the print job. A print driver is provided which is capable of forwarding one or more print jobs over a network. The print driver may be interfaced with any suitable print job source (e.g., a client device capable of generating a printable document, such as a computer) to obtain a print job. The print job is forwarded from the print driver, over the network, to a spooling server. A printer polling device, which may be used at a location remote from the client device, is capable of polling a spooling server via the network to identify whether any print jobs associated with the printer polling device are available for printing at a printer currently associated with the printer polling device. The spooling server need not initiate contact with the printer through a firewall, since it is polled by the printer polling device. Thus, network security is maintained.

October 16, 2000

P A T E N T

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)

P. Lodwick)

Application No.:)

Filed: Herewith)

For: **PRINT DRIVER APPARATUS AND METHODS FOR
FORWARDING A PRINT JOB OVER A NETWORK**

DRAWING REVIEW BRANCH
Commissioner for Patents
Washington, D.C. 20231

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as Express Mail (No. EL 632260405 US) addressed to BOX PATENT APPLICATION, Commissioner for Patents, Washington, D C 20231 on October 16, 2000

By. Michele Hollis

Michele Hollis


TRANSMITTAL OF FORMAL DRAWINGS

Dear Sir:

Enclosed are eleven (11) sheets of formal drawings for filing in the above-referenced patent application.

Please advise the undersigned attorney if correction is necessary.

Respectfully submitted,



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Date: October 16, 2000
ATTORNEY DOCKET NO.: MGI-179

2000 OCT 16 09:48:50

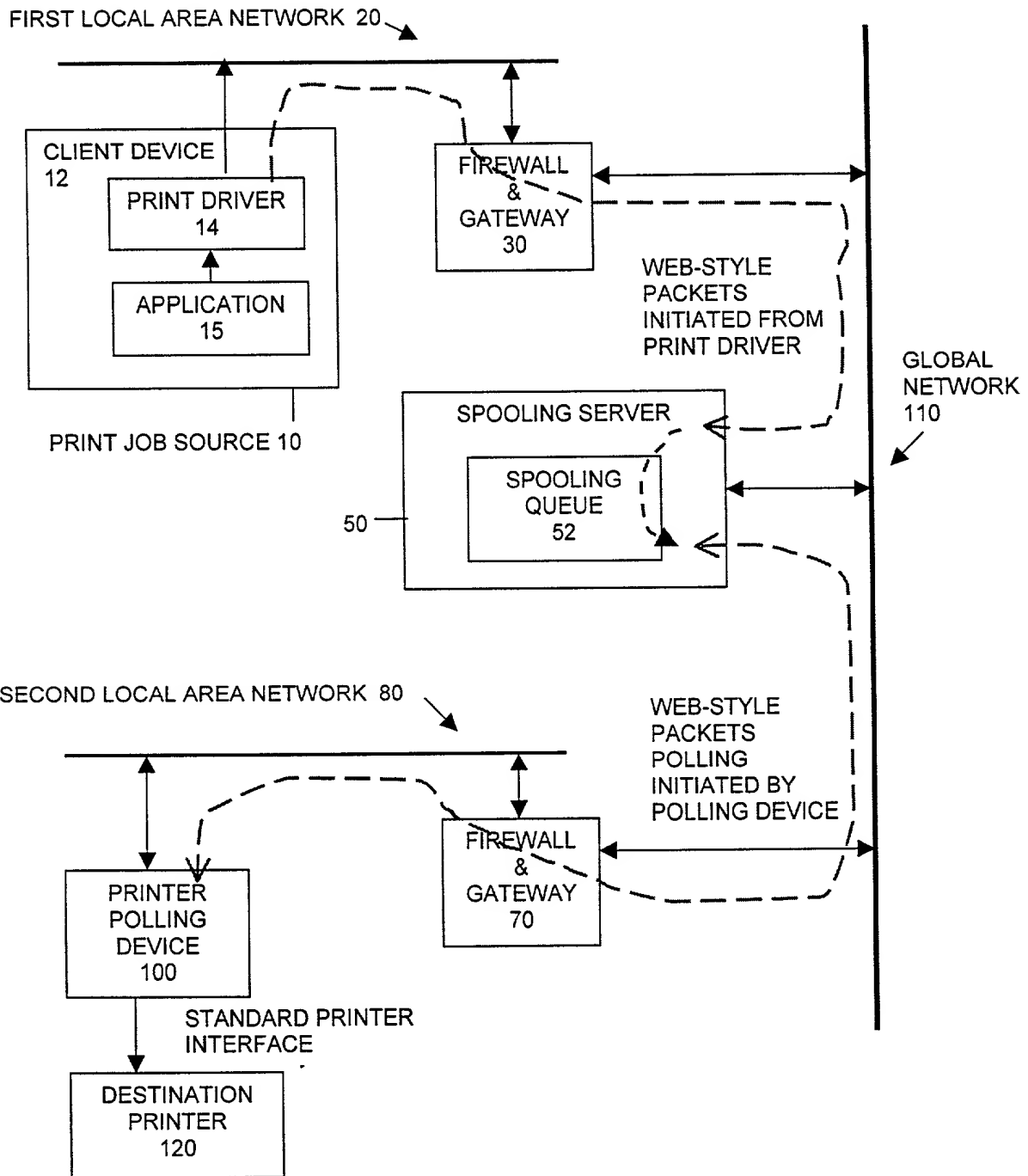


FIG. 1

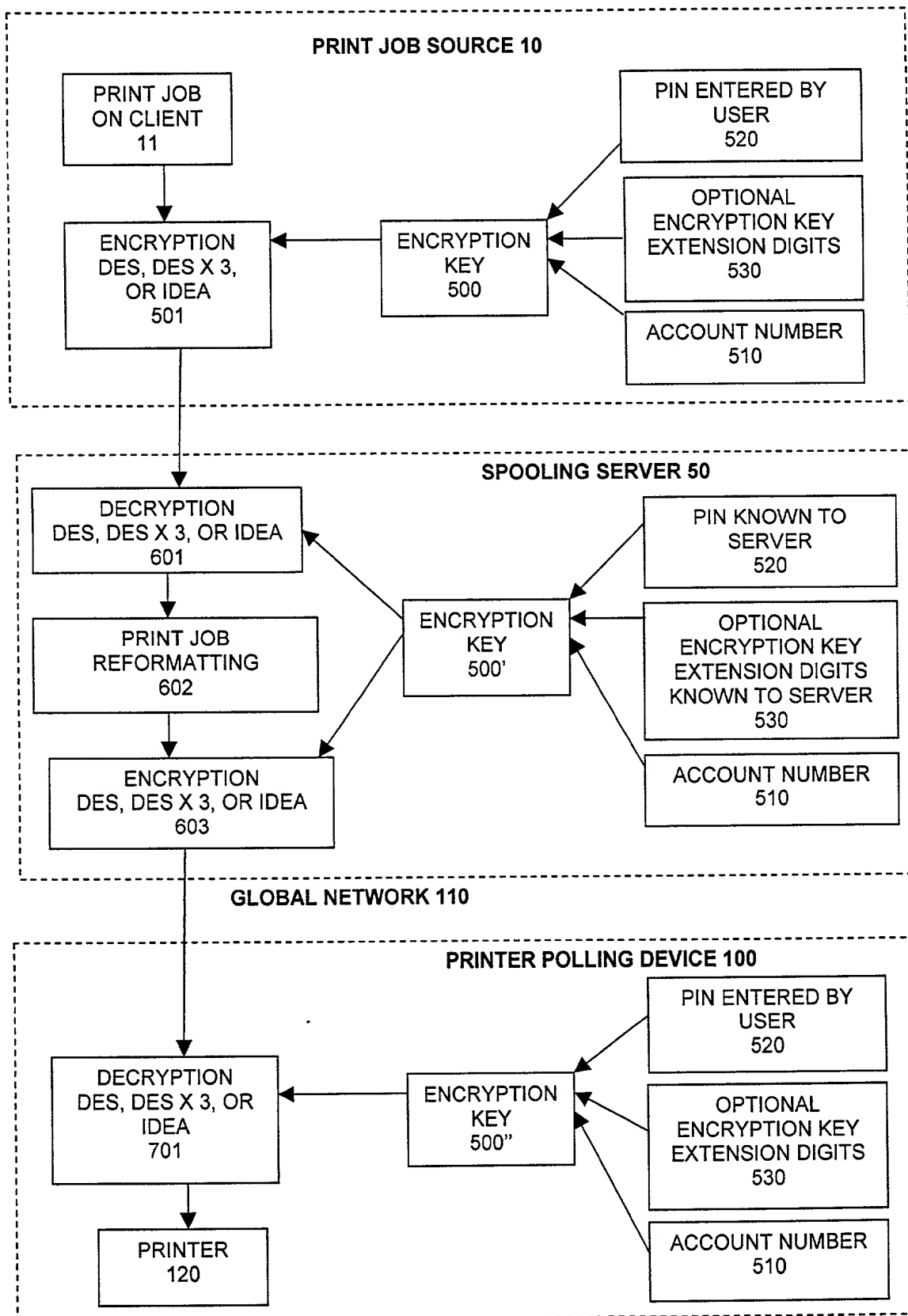


FIG. 2

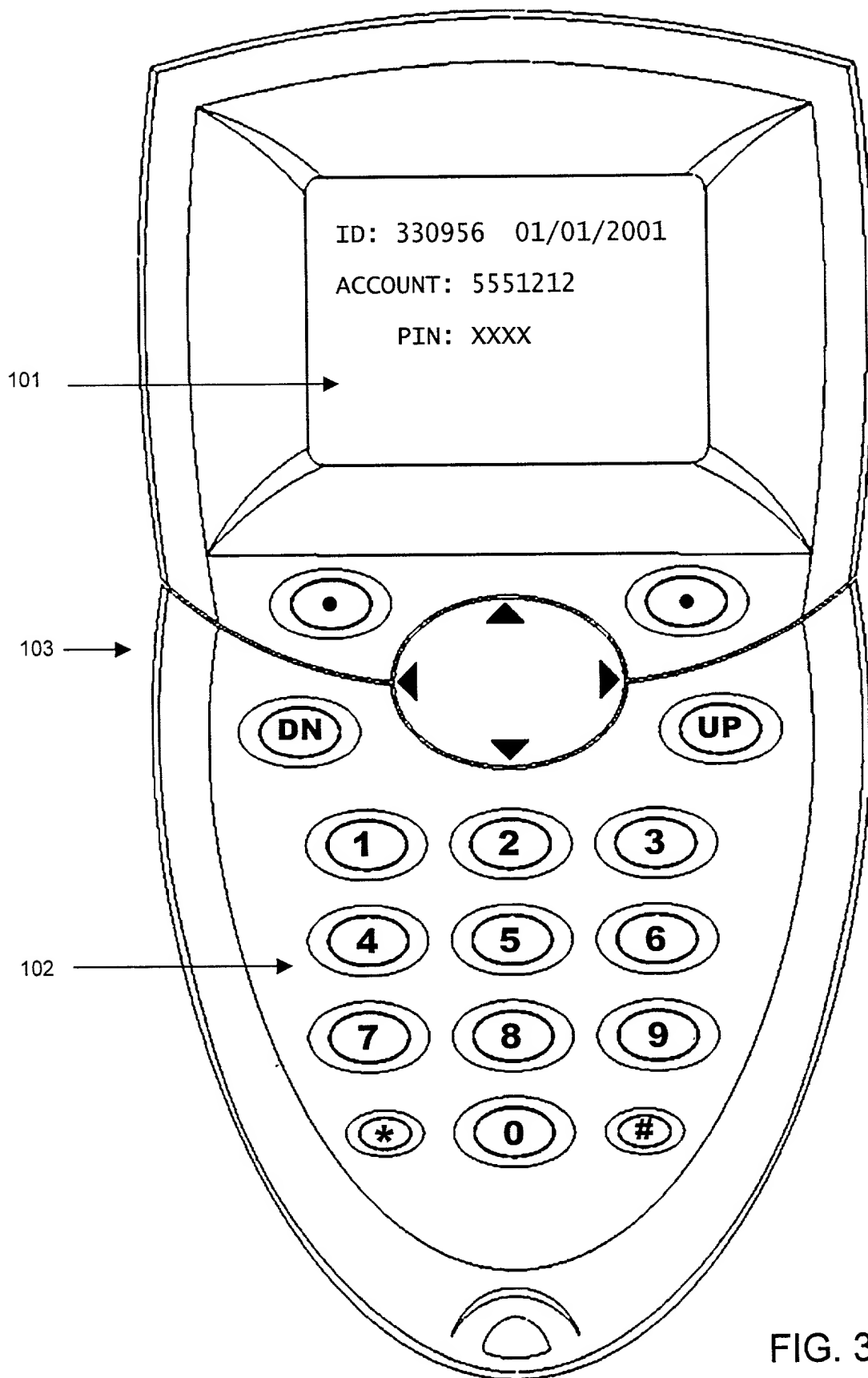


FIG. 3

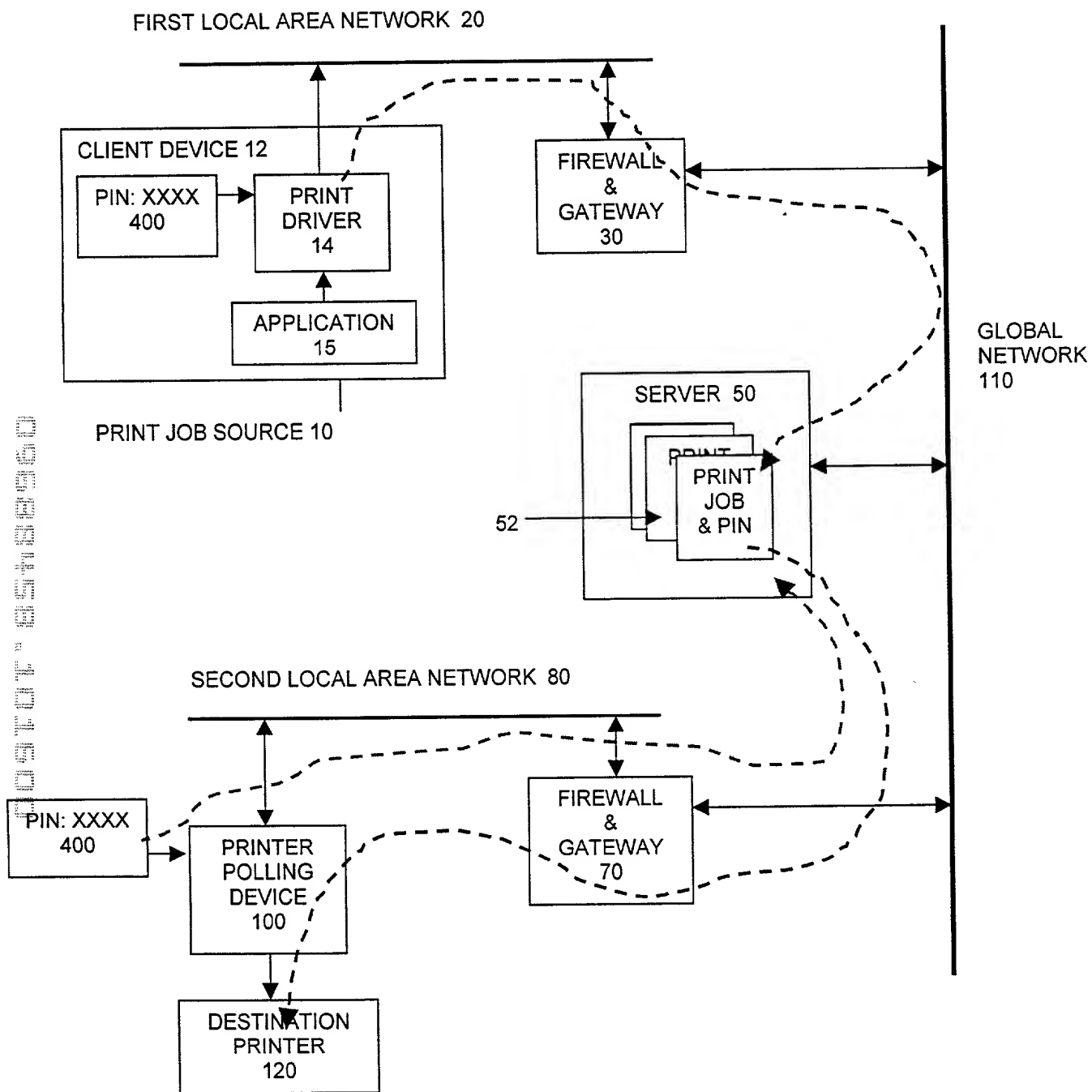


FIG. 4

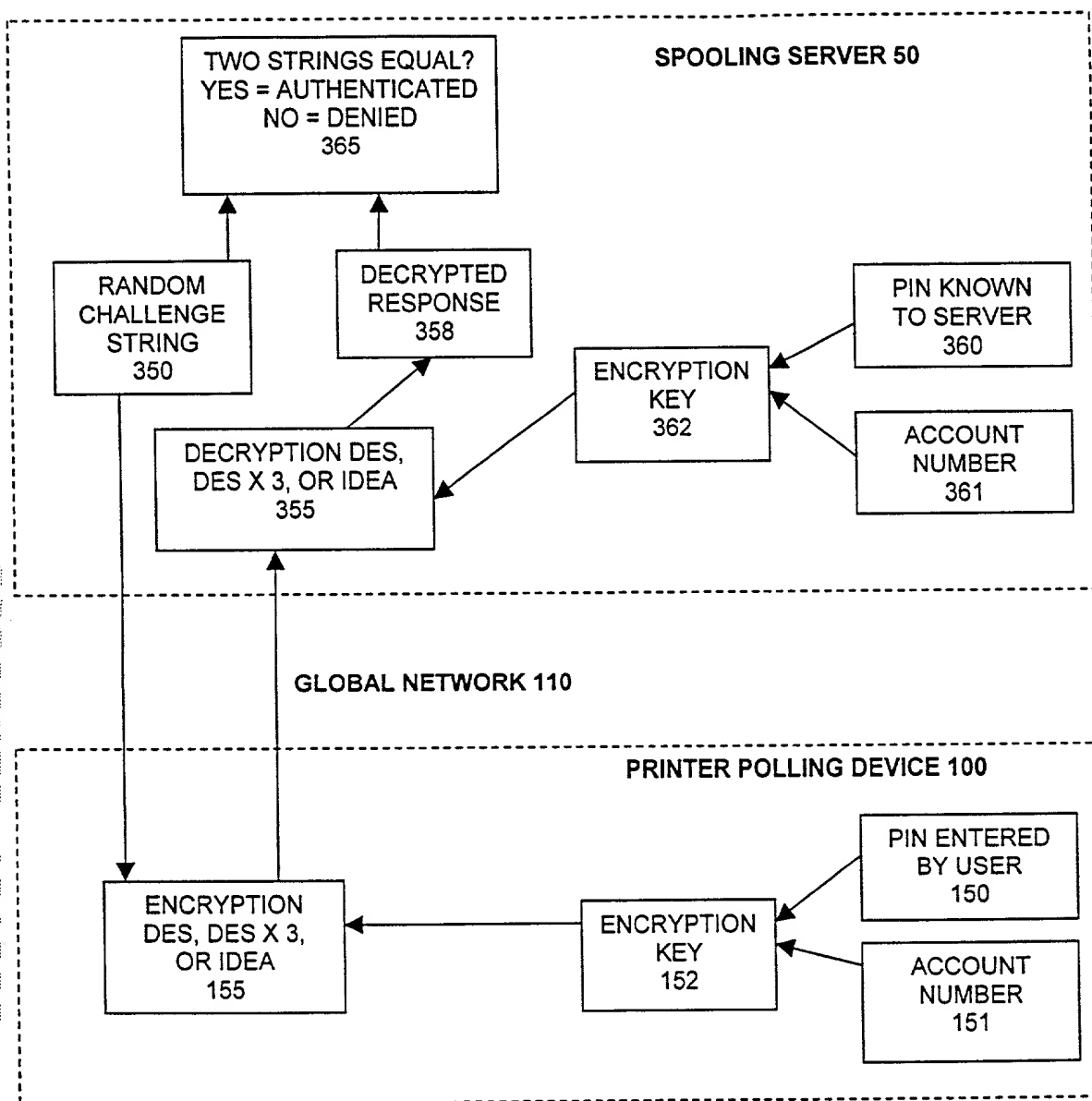


FIG. 5

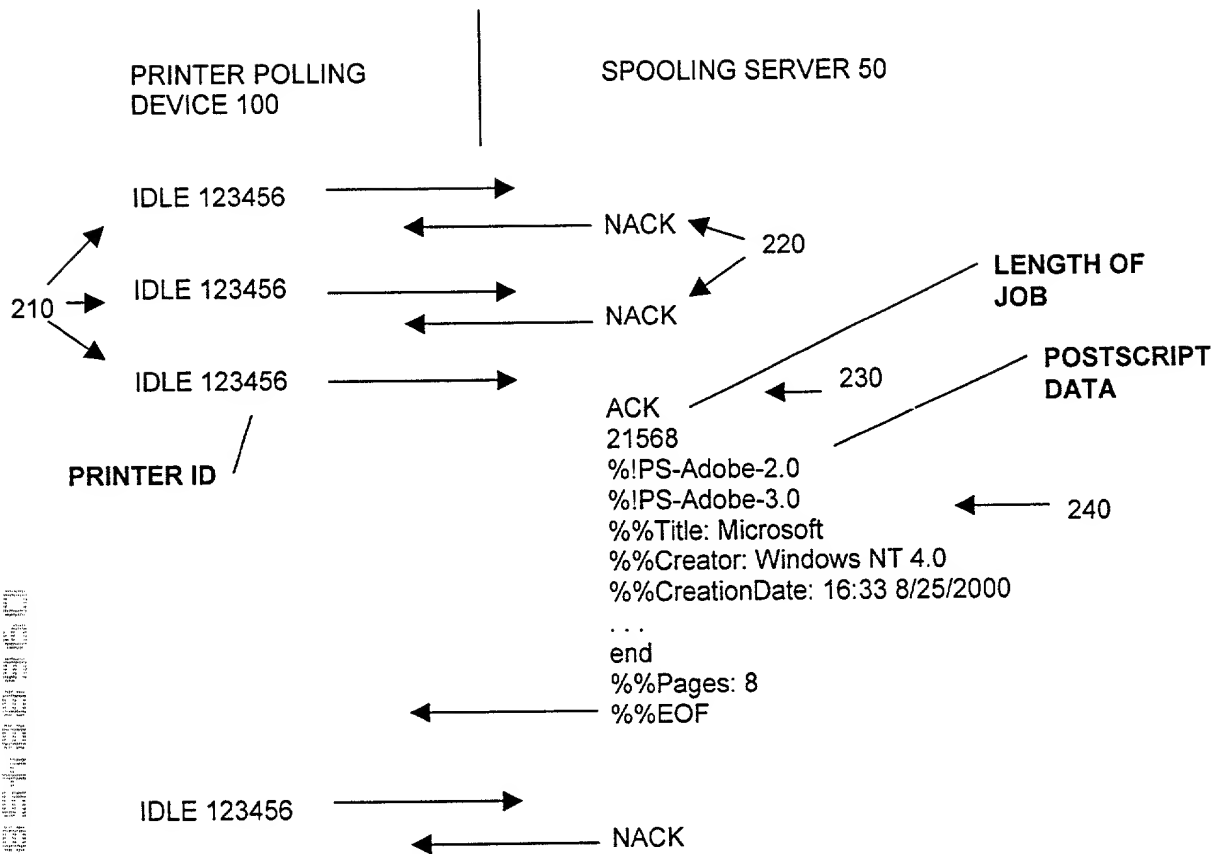


FIG. 6

FLOW DIAGRAM OF A PRINT JOB AND TARGET PRINTER FORMATTER.

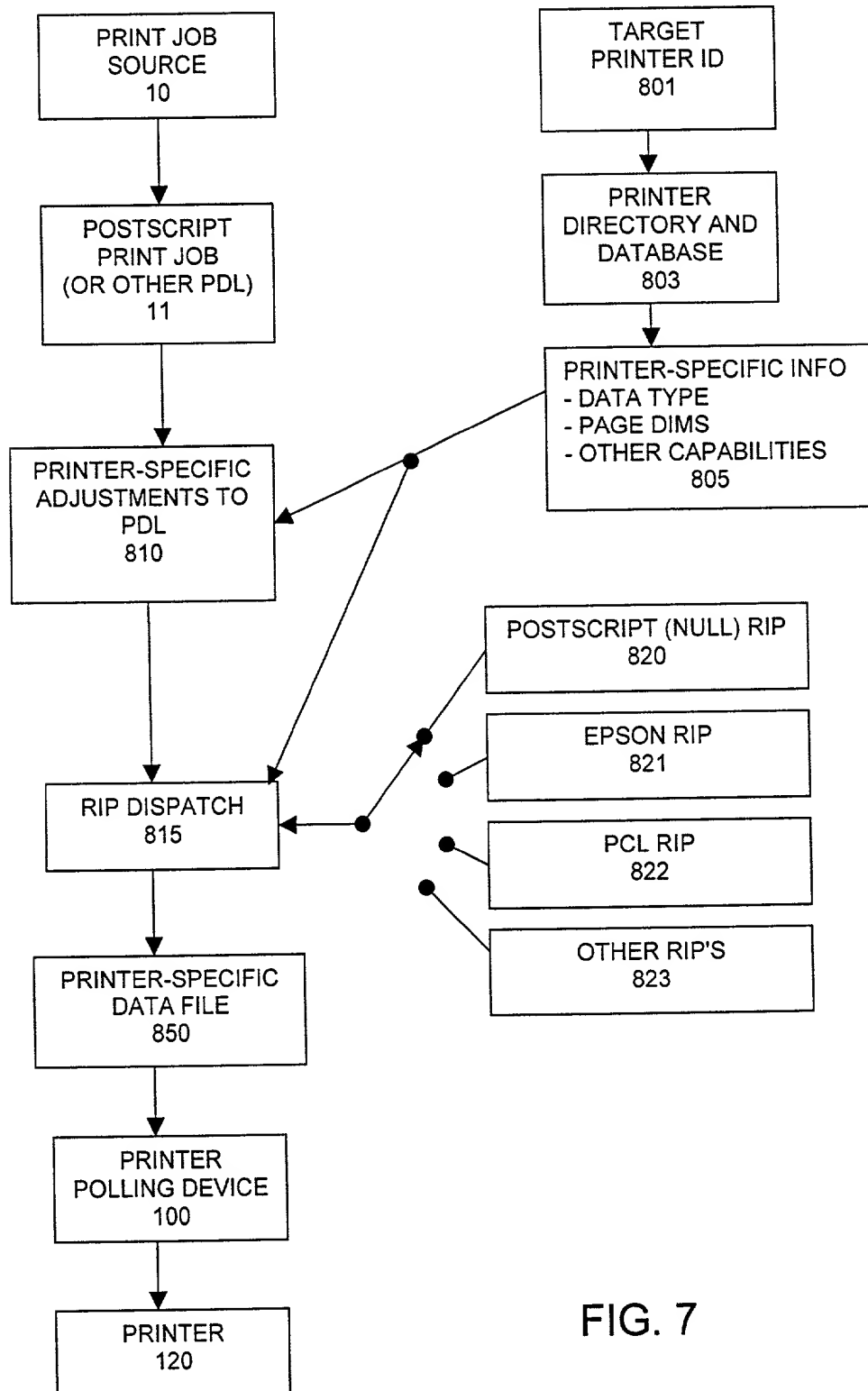


FIG. 7

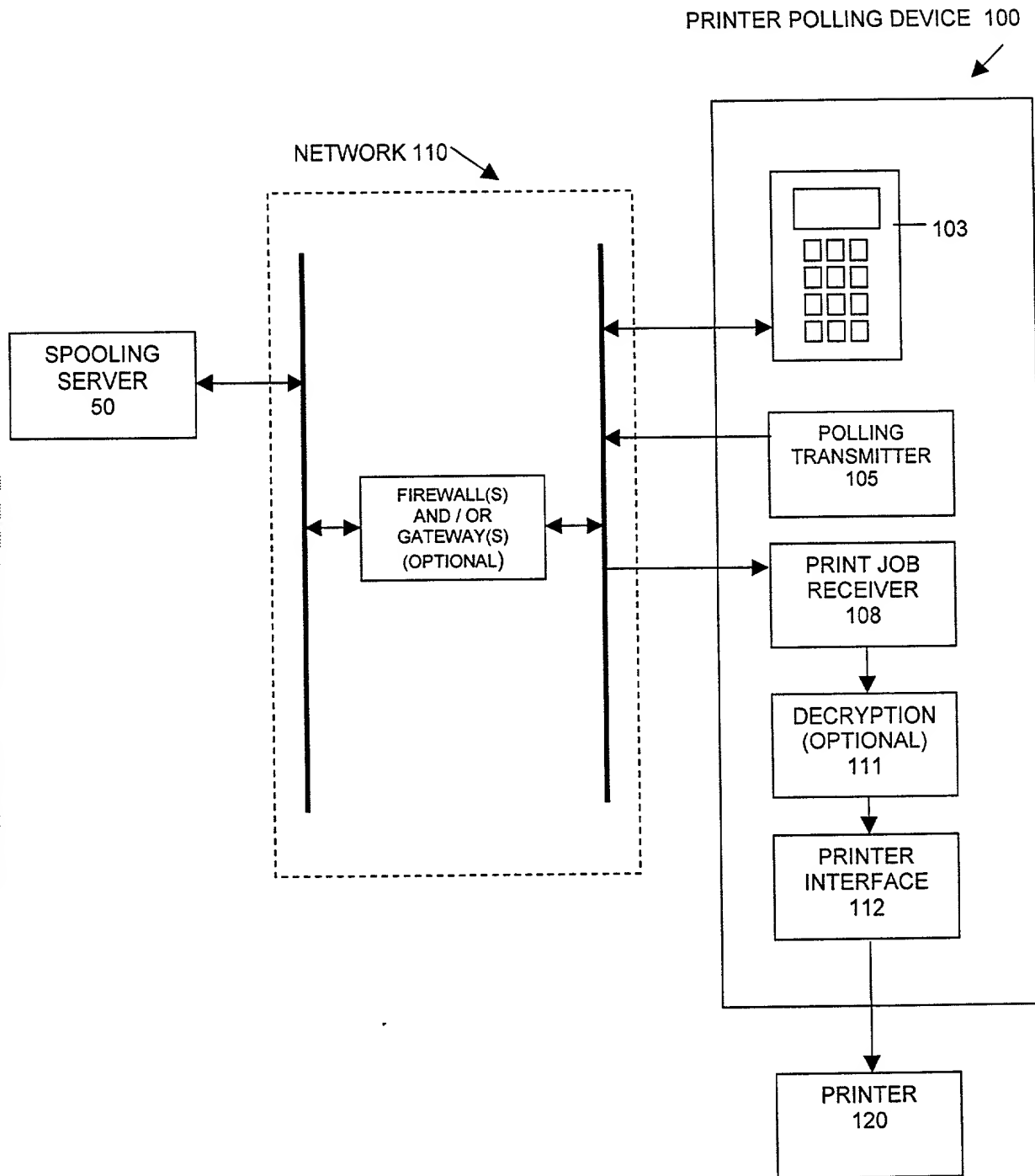


FIG. 8

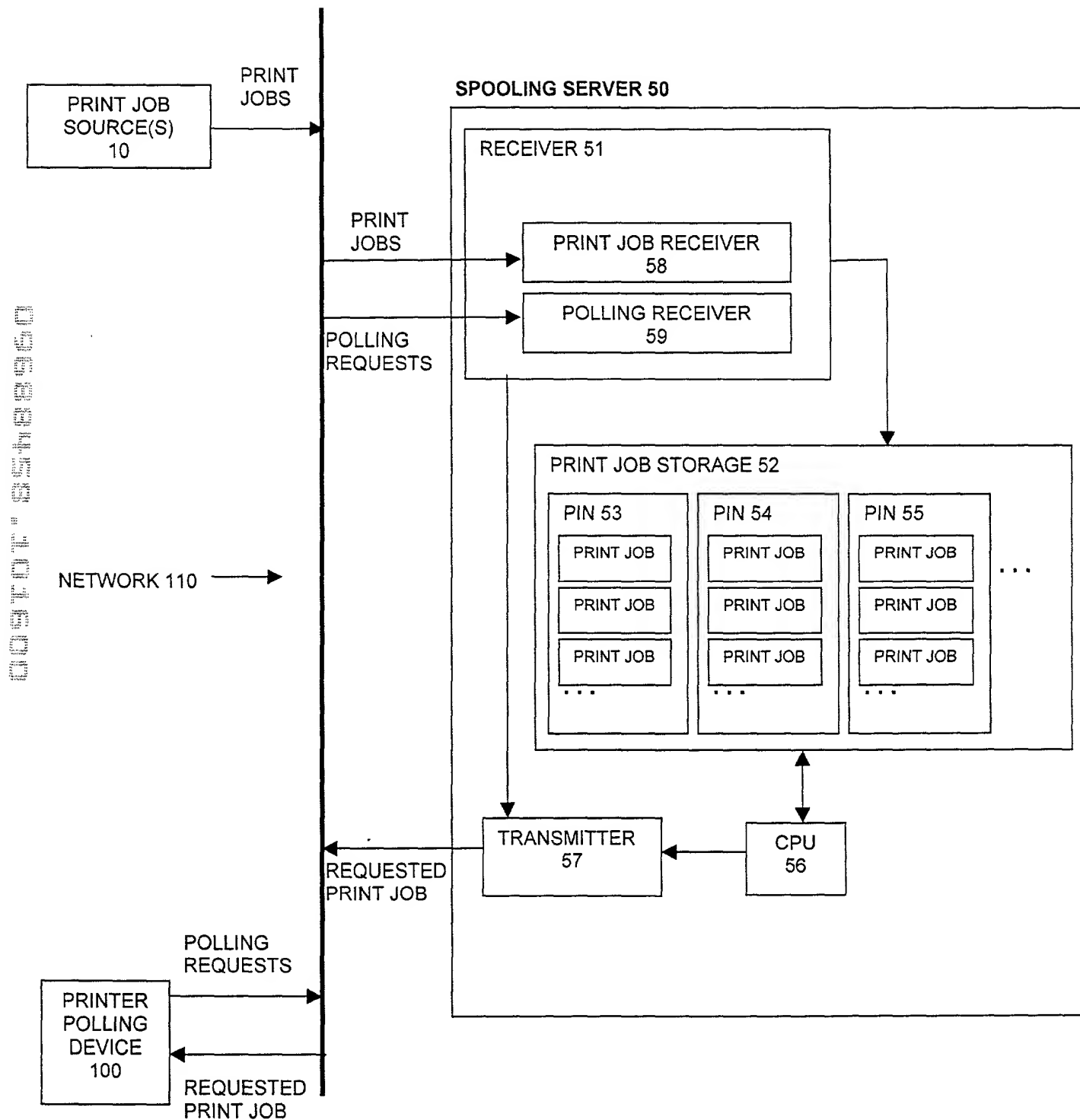


FIG. 9

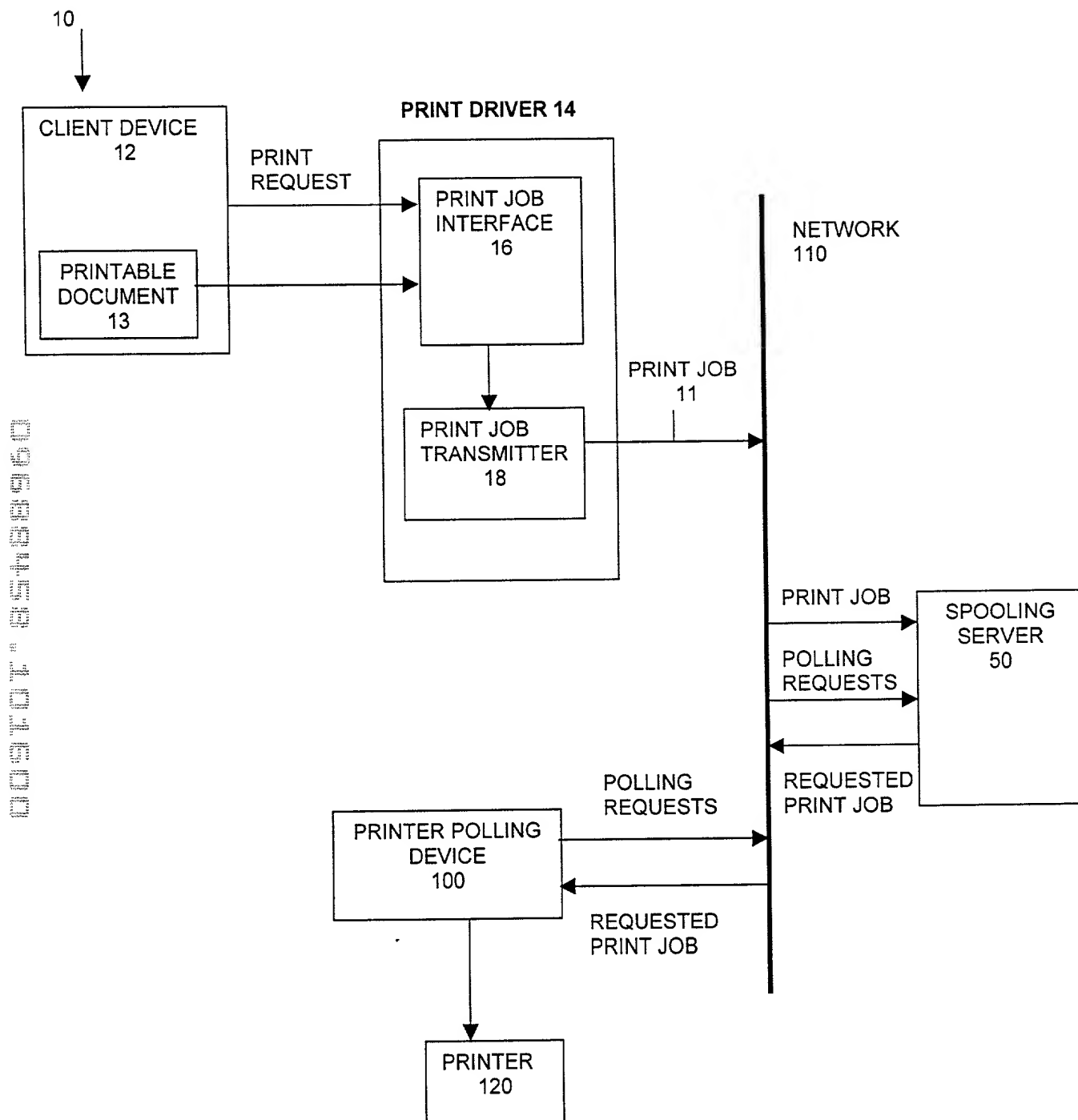


FIG.10

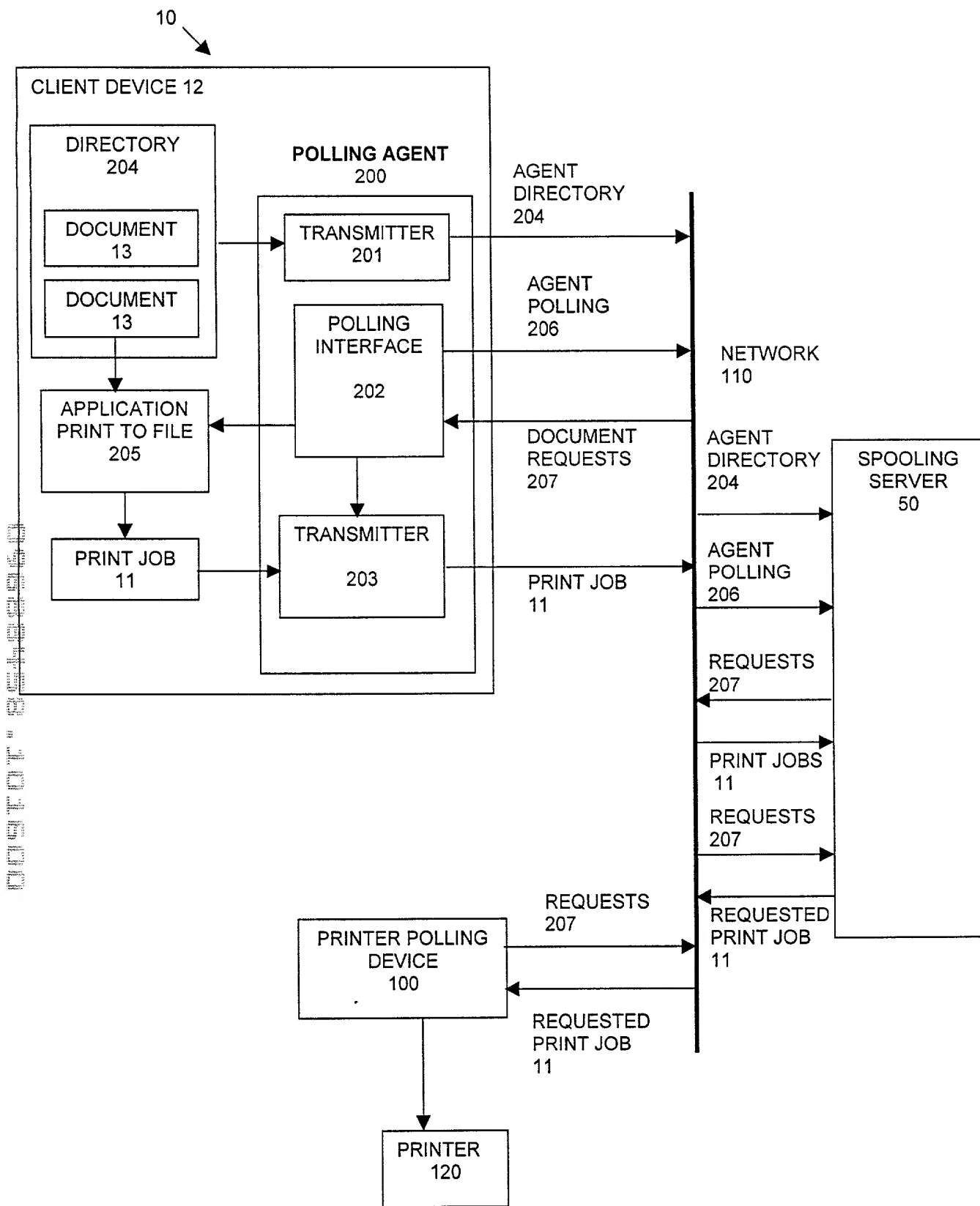


FIG.11